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Lipid Membrane Composition Analyzed by Multi-isotope Imaging Mass Spectrometry

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Lipid membrane composition analyzed by Multi-isotope Imaging Mass Spectrometry

The lateral organization of lipids and membrane-associated proteins in biological membranes is often detected by fluorescence microscopy. Although extremely sensitive, fluorescent labels, particularly those attached to lipid molecules, may alter their physical properties.

Multi-isotope imaging mass spectrometry (MIMS) using a NanoSIMS50 (Cameca) offers the opportunity to determine the lateral composition with very high lateral resolution (50nm), with component-specific information encoded by elemental and isotopic composition. Data will be presented on proteins deposited on SiO_2 (40 nm thick) by microcontact printing. Patterns of uniformly ^{15}N labeled proteins can be readily distinguished from natural abundance (mostly ^{14}N) proteins by detection of $^{12}C^{15}N^-$ *vs.* $^{12}C^{14}N^-$ fragments (see figure).

Microcontact printed proteins can be used to pattern supported bilayers [1]. Methods have been developed to freeze dry the bilayer largely retaining its lateral organization. Phospholipids can be imaged using CN^- or P^- and distinguished from protein barriers. By manipulating the isotopic composition of different lipid and/or membrane, spontaneous lateral organization or reorganization in response to an electric field parallel to the bilayer surface [1] can be probed.

[1] Acc. of Chem. Res., 35, 149 (2002)

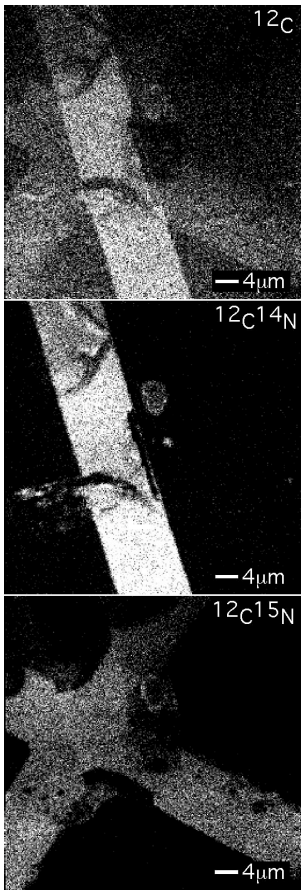

Figure*: Fibronectin (^{14}N) and ^{15}N-Acp2 microcontact printed on SiO_2.*

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